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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte CHUNXIN JI,
CHRISTIAN WIESER, MARK MATHIAS,
and PAUL. D. NICOTERA

Appeal 2015-005779
Application 12/185,479
Technology Center 1700

Before ADRIENE LEPIANE HANLON, CATHERINE Q. TIMM, and BEVERLY A. FRANKLIN, *Administrative Patent Judges*.

HANLON, *Administrative Patent Judge*.

DECISION ON APPEAL

A. STATEMENT OF THE CASE

The Appellants filed an appeal under 35 U.S.C. § 134 from a final rejection of claims 1, 3–5, 7, 8, 10, 14–16, 18, 19, 21, and 25, which are all of the pending claims. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

Representative claim 1 is reproduced below from the Claims Appendix of the Appeal Brief dated November 17, 2014 ("App. Br."). The limitations at issue are italicized.

1. A gas diffusion layer for use in a fuel cell comprising a flow field, an ion conducting membrane, and an electrode, the gas diffusion layer comprising:

a gas permeable diffusion substrate; and

a microporous layer disposed over the gas permeable diffusion substrate, the microporous layer comprising about 68.7 weight percent carbon powders, about 25.1 weight percent fluorocarbon polymer binder, and *about 6.2 weight percent of a plurality of electrically particles dispersed therein*, the plurality of particles including *electrically conductive flakes having a largest dimension from about 5 microns to about 15 microns and a smallest dimension from about 1 micron to about 5 microns*, presence of the plurality of particles increasing gas transport resistance across the microporous layer, the diffusion layer positionable between the electrode and the flow field.

App. Br., Claims App. 1.

Similarly, independent claims 14 and 25 are directed to a fuel cell comprising, *inter alia*, a microporous layer including a "plurality of particles including electrically conductive flakes having a largest dimension from about 5 microns to about 15 microns and a smallest dimension from about 1 micron to about 5 microns." App. Br., Claims App. 2, 4.

The claims on appeal stand rejected as follows:

(1) claims 1, 3–5, 7, 8, 10, and 25 under 35 U.S.C. § 103(a) as unpatentable over Ji et al.[1] in view of Kinkelaar et al.,[2] Lebowitz et al.,[3] and Jousse et al.;[4] and

(2) claims 14–16, 18, 19, and 21 under 35 U.S.C. § 103(a) as unpatentable over Ji in view of Lebowitz and Jousse.

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[1] US 2006/0046926 A1, published March 2, 2006 ("Ji").
[2] US 2004/0191605 A1, published September 30, 2004 ("Kinkelaar").
[3] US 2005/0130023 A1, published June 16, 2005 ("Lebowitz").
[4] US 2004/0028993 A1, published February 12, 2004 ("Jousse").

B. DISCUSSION

The Examiner finds Ji discloses a gas diffusion layer for use in a fuel cell comprising, *inter alia*, a microporous layer comprising carbon particles and a fluorocarbon polymer binder. Final 3 (citing Ji ¶ 42).[5] Ji discloses that the weight ratio of carbon particles to fluorocarbon polymer particles is from about 9:1 to about 1:9, and preferably from about 3:1 to about 1:3. Final 4; Ji ¶ 43. The Examiner finds Ji does not expressly disclose that the microporous layer includes electrically conductive flakes as recited in the claims on appeal. Final 3. Thus, the Examiner turns to Kinkelaar. The Examiner finds Kinkelaar discloses a gas diffusion layer comprising, *inter alia*, an electrically conductive material coating. Final 3. The electrically conductive material comprises a mixture of at least one inherently conductive polymer, particulate electrically conductive carbon (e.g., graphite flakes), and a liquid medium. Kinkelaar ¶ 39; Final 3. The Examiner finds Kinkelaar discloses that the graphite flakes constitute between about 1% and about 25% of the mixture by weight. Final 3; Kinkelaar ¶ 39.

The Examiner concludes that it would have been obvious to one of ordinary skill in the art "to combine the graphite flakes of Kinkelaar with the microporous layer of Ji" for the known benefit of "improved resiliency, flexibility, and ease of handling." Final 3.

As for the dimensions recited in claims 1, 14, and 25, the Examiner relies on Lebowitz and Jousse. The Examiner finds Lebowitz discloses a gas diffusion layer comprising one or more layers of an electrically conductive material, such as graphite flakes. Final 5; Lebowitz ¶ 25. The Examiner finds Lebowitz teaches using graphite flakes having a D50% of about 5, 20, and 50 μm, wherein "the term

[5] Final Office Action dated June 17, 2014.

D50% is defined as the size at which 50%, by number, of the particles are no larger than." Final 5; Lebowitz ¶¶ 131, 28.

The Examiner also finds Jousse discloses graphite flakes for use in a fuel cell, wherein the graphite flakes have "a side dimension of 5 to 20 μm and between 0.1 and 5 μm thick." Ans. 2;[6] Jousse ¶ 35. The Examiner finds the dimensions disclosed in Jousse fall within the claimed dimensions, i.e., "largest dimension from about 5 microns (μm) to about 15 microns and a smallest dimension from about 1 micron to about 5 microns."[7] Ans. 2–3.

The Appellants argue that the D50% values disclosed in Lebowitz are not the largest dimensions or the smallest dimensions of the flakes but rather represent median values of the particle dimensions. App. Br. 5. "From the values disclosed in *Lebowitz et al.*," the Appellants argue "it is not at all clear what the largest dimension is or the smallest dimension." App. Br. 6. To illustrate, the Appellants provide the following example:

> [F]lakes having a smallest dimension for 1 to 2 microns and a largest dimension from 100 to 101 microns will have an average size of about 50 microns. An average value of 50 microns is completely remote from either the largest or smallest dimensions in this example.

App. Br. 6.

We recognize that the dimensions in Lebowitz relied on by the Examiner are D50% values. *See* Lebowitz ¶ 131 (disclosing the D50% value of various flakes). Nonetheless, the Examiner finds Jousse discloses a graphite flake having

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[6] Examiner's Answer dated March 13, 2015.
[7] More accurately, the dimensions disclosed in Jousse overlap the claimed dimensions. *See In re Peterson*, 315 F.3d 1325, 1329 (Fed. Cir. 2003) ("Clearly, Peterson's application and Shah contain overlapping ranges, as each range listed in Peterson's claim 5 lies within the corresponding range disclosed in Shah. Thus, Shah's ranges encompass Peterson's.")

dimensions that overlap the claimed dimensions. The Examiner concludes that it would have been obvious to one of ordinary skill in the art to modify the dimensions of Kinkelaar's graphite particles as disclosed in Jousse because graphite flakes having the dimensions disclosed in Jousse where known to be an acceptable size for use in a fuel cell. Ans. 3. The Appellants do not direct us to any error in the Examiner's conclusion of obviousness or the Examiner's underlying factual findings as to Jousse.

As for the amounts recited in claim 1,[8] the Appellants argue that "the total amount of carbon particulates in *Kinkelaar et al.* is at most 25 percent whereas in the present invention, the amount is about 74.9 percent (i.e., carbon powder and electrically conductive flakes)." App. Br. 7. Thus, the Appellants argue that "*Kinkelaar* is inconsistent with the claimed composition having 68.7 weight percent carbon **and** about 6.2 weight percent of a plurality of electrically particles having graphite flakes." App. Br. 7.

The Appellants' argument is not persuasive of reversible error. In the rejection on appeal, the Examiner *combines* the graphite flakes of Kinkelaar with the microporous layer of Ji. Final 3. The Examiner finds:

> Ji . . . discloses the ratio of carbon particles and the fluorocarbon polymer is from about 3:1 to about 1:3 (from about 75%:25% to about 25%:75%) ([0043]) and Kinkelaar discloses the amount of graphite powder between 1–25% by weight ([0039]) Thus, Ji and Kinkelaar [, when combined,] disclose overlapping ranges with the claimed material weight percent.

Final 4 (emphasis omitted). That is, the Examiner finds that when the graphite flakes of Kinkelaar are added to the microporous layer of Ji (comprising carbon

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[8] Independent claims 14 and 25 do not recite the amount of carbon powders, fluorocarbon polymer binder, or plurality of electrically particles.

particles and a fluorocarbon polymer binder), the amounts of carbon particles, fluorocarbon polymer binder, and graphite flakes in the modified microporous layer of Ji would overlap the amounts of carbon powders, fluorocarbon polymer binder, and plurality of electrically particles, respectively, recited in claim 1.[9] The Appellants do not direct us to any evidence to the contrary.

The Appellants do not present arguments in support of the separate patentability of any of dependent claims 3–5, 7, 8, 10, 15, 16, 18, 19, and 21. Thus, for the reasons set forth above, the § 103(a) rejections on appeal are sustained.

C. DECISION

The Examiner's decision is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1).

AFFIRMED

[9] The Examiner also finds Kinkelaar teaches that the final dry weight ratio of the conductive carbon and the polymer is about 75% carbon particulates, graphite powder, or graphite flakes and about 25% polymer. Ans. 6 (citing Kinkelaar ¶ 40). The Examiner finds "the 75% amount of carbon disclosed by Kinkelaar seems incredibly close to the about 74.9 percent of carbon powder and electrically conductive flakes of the claimed invention." Ans. 6. The Appellants do not address the Examiner's findings.